Evaluating E-Learning within Automotive Small-Medium Suppliers (2) The Evaluation Results

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Abstract:

The two articles deal with the complex issue of evaluating e-learning and benchmarking with traditional face-to-face training. It is based on the implementation of an experimental e-learning platform dedicated to SMEs within the automotive supply chain. The first paper presents the evaluation tool kit that has been specifically designed from an extensive literature survey. The second part presents the results from the evaluation of the experimental e-learning platform and courses by trainees, tutors, managers and directors who have been involved in the trial sessions.

Key Words

Automotive, Suppliers, e-learning, evaluation

Biographical Notes

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He has published extensively via books, articles in refereed journals and conference papers in Industrial Economics, Economics of Innovation and Technology Management since 1973 when he received his PhD at the University of Grenoble. He also holds a HDR in Economics. He is Associated Professor and Researcher with Henley Management College, Manchester University and Newcastle University in the UK. He is a well-recognized expert in the automotive industry. He is consultant to International Organizations (EU, OECD, ILO, UNIDO), professional organizations (CCFA, FIEV, JAMA, CLEPA), OEMs (PSA, Renault, Toyota, Nissan, DaimlerChrysler) and component manufacturers. He is a member of the French Society of Automotive Engineers (SIA) and the GERPISA International Network of Researchers on the Auto Industry.

This second article presents the results of the analysis of evaluations of the trial e-training sessions carried out in the SMEs that are members of the ELSA Consortium between June 2002 and the end of January 2003. It also presents the results of qualitative interviews carried out in the three SMEs in late January and early February 2003. The paper is concerned with the ideas and their interpretation about evaluation of e-learning derived from:

- Evaluation forms given to trainees and tutors, managers and directors,

- And targeted interviews of trainees, tutors, managers and directors for qualitative assessment.

The advantages and weaknesses of the ELSA e-learning platform are assessed and analyzed. The results confirm that SMEs' employees are willing to test and use e-learning. It is important to mention that such interest is highly correlated with the position, the initial background and the age of the trainees. The higher the position in the hierarchy, the higher educational level, the more initial acceptance is granted to e-learning.

Concerning the often discussed crucial issue of return on investment, there is a consensus on the idea of a smaller cost of e-learning when compared to traditional solutions, above all if one looks at significant financial factors like long term efficiency and number of users. There is of course no statistically reliable calculation of ROI regarding cost efficiency at this point after the pilot phase. Reliable data on the reaction, learning and transfer level are constitutional for defining a possible long-term ROI. The relevant organizational variables which still have to be thoroughly monitored and assessed during later interviews hint at the usual value added (and not only financial) factors like production, scrapping, customer satisfaction, time spent on learning and meetings, start-stop times in production, learning transfer etc. For the time being, one can rely on qualitative and quantitative data regarding reaction/satisfaction, learning and transfer. Especially the lack knowledge transfer serves as a main formative evaluating argument, namely to adjust the needs analysis – and not only the desirable contents- in a more systematic and customer oriented way in the future exploitation phase.

2.1. The use of the ELSA evaluation tool kit

The ELSA evaluation tool kit has been adapted from existing methods taking into account an abundant literature background and the specific needs of the project. It is a mix of five different methodological options, depending on the evaluation actors and the information desired by the programme steering committee. It has been designed in order to meet the SME-specific needs and requirements, in particular the lack of time and commitment: the tools are simple and very easy to complete. the tool kit was made of the following tools: the Anecdotal Record Form (ARF), the Evaluation Questionnaire (EQ), the User Interface Rating Form (UIRF), the Evaluation Interview Protocol (EIP), and a Complementary Qualitative Interview Guide (CQIG) that has been used in interview with trainees, managers and directors.

The following numbers of forms were reached:

Tool	Number
Anecdotal Record Forms	**63**
Evaluation Questionnaires	**44**
User Interface Rating Forms	**37**
Evaluation Interview Protocols	**5**
Complementary Qualitative Interview Guides	**20**

In order to provide the basis for a comprehensive evaluation of ELSA modules, it has been carried out the following mix of the four tools, evaluators and periods:

	TYPE	EVALUATORS	OPTIONAL SCHEDULE	REALISATION
1	Anecdotal Report	TRAINEES	During training	**YES**
2	Evaluation questionnaire	TRAINEES	End-of-module	**YES**
2bis	Evaluation questionnaire	TRAINEES	Eight weeks later	**NO**
3	Rating	TRAINEES	End-of-module	**YES**
3bis	Rating	TRAINEES	Eight weeks later	**NO**
4	Evaluation Questionnaire	TUTORS	End-of-module	**YES**
4bis	Evaluation Questionnaire	TUTORS	Eight weeks later	**NO**
5	Interview	TRAINEES	End-of-module	**NO**
	Interview	TRAINEES	Eight weeks later	**YES**
6	Interview	MANAGERS	End-of-module	**NO**
6bis	Interview	MANAGERS	Eight weeks later	**YES**
6ter	Interview	MANAGERS	Six month later	**NO**
7	Interview	CEO/DIRECTOR	End-of-module	**NO**
7bis	Interview	CEO/DIRECTOR	Eight weeks later	**YES**
7ter	Interview	CEO/DIRECTOR	Six month later	**NO**

Due to time constraints and delay in testing the modules by the SMEs, it has not been possible to carry out the eight-weeks later formal evaluation forms. Only interviews were possible. It has to be pointed out that the ELSA Consortium decided the following changes of the initial scheduling and mix at the request of SMEs employees and managers since they were far too busy:

- To limit the filling of written forms to the end-of-module period;
- To focus the face-to-face interviews during the six-to-eight-weeks period.

2.2. E-learning time allocation

Each SME allocated the following amount of time to trainees in order to learn their module(s):

	Planned		Actual	
Company	**Study Time**	**Tutor Time**	**Study Time**	**Tutor Time**
TS	595	210	385	210
RA	210	100	350	250
SV	728	200	750	250
TOTAL	1533	510	1485	710

The population that has been trained is the following:

SUBJECT	**RA**	**TS**	**SV**	**TOTAL**
Management & Leadership	**2**			**2**
Managing Quality	**7**	**9**	**6**	**22**
FMEA	**7**	**6**	**9**	**22**
Capable Process	**7**	**8**	7	**22**
Project Management	**1**	**2**		**3**
Microsoft Excel		**8**		**8**
ISO14001	**1**	**2**	**1**	**4**

The objectives of the SMEs were indeed different, associated to their specific needs. But overall, it could be considered that the three SMEs shared the following aims:

1. Experiment and test e-learning materials for the very first time in real job conditions;

2. Get some of their employees to acquire and learn new knowledge in order to improve their competencies;

3. Test the cost of an e-learning solution measured in time dedicated by trainees, tutors and managers, above all in terms of value adding organizational factors;

;

4. Improve the company's performances through the improvement of individuals' skill.

That is why qualitative and quantified interviews have been focused on the impacts of e-learning and the so-called returns on investment and objectives, i.e. the completion or satisfaction of these common objectives through an e-learning solution.

2.3. The Evaluation Figures

2.3.1. The Incidents

63 Anecdotal Record Forms have been completed with the following proportions:

Erreur ! Liaison incorrecte.

- 66% were errors in running the e-learning modules. The most important and frequently quoted error (24 times out of 45 or 38% of the total) is "**mistake in content and tests**";

- 12% were computers and connexion problems;
- 7% pinpointed mistakes in the software: mistakes, downloading impossible,
- 6% reported errors or weaknesses in the translation to English;

2.3.2. The Rating

37 User Interface Rating Forms have been answered.

With a scale from 1 to 10, trainees and tutors put relatively high marks in particular to "Ease of Use", "Media Integration", "Aesthetics" and "Screen Design". Comments were not frequent but strictly reflected the feeling expressed in the rating. The most critical rating and comments were formulated by trainees with an intellectual background, i.e. tutors, managers and directors. Generally speaking, trainees were relatively enthusiastic, most of them because they enjoyed using computers for learning.

There are huge difference between Italy and the United Kingdom:

The Italian trainees were obviously much more enthusiastic than their British counterparts. They at least were more positive in their rating. Such difference might be of cultural nature but also linked to the experimental nature of the project and above all due to the differences in content material and complexity. Trainees might feel that they should point out systematically content and technical weaknesses, and therefore be critical. Some others might feel that they should mainly emphasize the innovativeness of e-learning, without being able to regard and compare the course content and its heterogeneous complexity over the population.

It is indeed interesting to analyze the impact of different demographic and professional variables, such as the sex and the job position. It is worth pointing out that women (8 out of 37 answers) were in general more critical than men on navigation, cognitive load, mapping, screen design, and aesthetics. They were more satisfied with ease of use, information presentation and knowledge space compatibility.

	Average	Male	Female	Director	Manager	Supervisor	Operator
Ease of Use	7,0	6,8	7,6	7,3	7,0	7,0	6,8
Navigation	6,2	6,3	5,9	4,3	6,2	6,4	7,0
Cognitive Load	6,4	6,6	5,5	5,0	6,4	6,7	6,3
Mapping	6,0	6,2	5,4	4,3	5,6	6,4	7,3
Screen Design	6,6	6,9	5,8	5,3	6,1	6,7	9,0
Knowledge Space Compatibility	6,3	6,1	6,5	4,7	6,4	6,3	6,0
Information Presentation	6,2	6,2	6,3	6,3	5,8	6,6	6,5
Media Integration	6,8	6,9	6,5	6,0	7,1	6,6	7,0
Aesthetics	6,7	6,7	5,9	6,3	6,1	6,6	7,8
Overall Functionality	6,0	6,0	5,8	5,3	5,0	6,5	6,3

As shown in the next table and not surprisingly, there is a clear correlation between the intensity in the use of internet and the level of satisfaction with the ELSA courses. Intensive internet users (more than 28 hours) were more enthusiastic in their rating than the others (less than 28 hours).

There is also a clear relationship of the rating with the length in service in the company: the longer, the more critical are the employees regarding the characteristics of the e-learning site.

	Average	The less connected	The most connected	Less than 5 years in firm	More than 5 years in firm
Ease of Use	7,0	6,3	7,5	7,1	6,9
Navigation	6,2	5,6	6,8	6,5	5,8
Cognitive Load	6,4	5,9	6,7	7,1	5,1
Mapping	6,0	5,8	6,2	6,4	5,4
Screen Design	6,6	6,6	6,6	7,1	5,9
Knowledge Space Compatibility	6,3	5,6	6,6	6,7	5,3
Information Presentation	6,2	5,8	6,6	6,9	5,1
Media Integration	6,8	6,2	7,2	6,7	6,9
Aesthetics	6,7	6,4	6,6	6,5	6,4
Overall Functionality	6,0	5,3	6,2	5,8	5,8

On some items, there is a huge difference. It is important to mention the gap in particular for with the cognitive load, navigation and information presentation. The knowledge and know-how of people employed since more than five years seem very influential. People more recently employed might have been more positive because they have more to learn through training.

An important dimension is obviously the nature of the course itself. It is clear that "capable process" and FMEA under-performed on most items when quality management was described as better designed than average.

	Average	FMEA	Capable Process	Quality
Ease of Use	7,0	6,3	6,2	7,0
Navigation	6,2	6,1	4,9	6,4
Cognitive Load	6,4	6,4	5,3	6,1
Mapping	6,0	6,4	4,9	6,1
Screen Design	6,6	6,6	5,7	6,3
Knowledge Space Compatibility	6,3	5,7	5,6	5,6
Information Presentation	6,2	5,9	5,3	6,5
Media Integration	6,8	6,5	5,6	7,3
Aesthetics	6,7	5,7	5,9	7,0
Overall Functionality	6,0	5,5	5,4	5,8

2.3.3. Course Evaluation

44 Evaluation Questionnaires were filled in properly. Questions were rated with a 1 (Strongly Disagree) to 5 (Strongly Agree) scale. The answers were the following:

Course Evaluations per Gender and Job Position

COURSE CONTENT	Average	Male	Female	Director	Manager	Supervisor	Operator
1. I was aware of the prerequisites for this course.	3,4	3,2	3,8	4,7	3,8	3,1	1,8
2. I had the prerequisite knowledge and skills for this course.	3,5	3,6	2,6	3,7	3,9	3,2	2,8
3. I was well informed about the objectives of this course.	3,6	3,6	3,5	4,3	3,8	3,4	3,5
4. This course lived up to my expectations.	2,9	3,0	2,4	3,0	2,8	2,8	3,3
5. The content is relevant to my job.	3,5	3,6	2,9	3,3	3,5	3,5	3,3
COURSE DESIGN							
6. The course objectives are clear to me.	3,5	3,6	3,3	4,0	3,6	3,3	4,0
7. The course activities stimulated my learning.	3,0	3,1	2,6	3,0	2,9	3,0	3,3
8. Interactive multimedia was essential in the course.	3,1	3,2	2,6	2,7	3,3	2,9	3,8
9. The activities in this course gave me sufficient practice & feedback.	2,5	2,6	2,4	3,0	2,8	2,4	2,3
10. The test(s) in this course were accurate and fair.	2,3	2,3	2,4	2,7	2,3	2,0	3,3
11. The difficulty level of this course is appropriate.	3,0	3,0	3,0	3,3	3,1	2,9	3,0
12. The pace of this course is appropriate.	3,4	3,4	3,1	3,3	3,2	3,6	3,0
COURSE INSTRUCTOR (FACILITATOR)							
13. The instructor was well prepared.	3,9	3,9	3,5	3,0	3,5	4,2	4,0
14. The instructor was helpful.	4,0	4,1	3,5	3,0	3,6	4,4	4,3
COURSE ENVIRONMENT							
15. The training facility at this site was comfortable.	3,4	3,4	3,5	4,0	3,3	3,5	3,3
16. The training facility at this site provided everything I needed.	3,4	3,3	3,8	4,0	3,3	3,4	3,5
COURSE RESULTS							
17. I accomplished the objectives of this course.	3,5	3,5	3,3	3,7	3,4	3,6	2,8
18. I will be able to use what I learned in this course.	3,4	3,4	3,1	3,7	3,3	3,4	3,3
SELF-PACED DELIVERY							
19. IMM was a good way for me to learn this content.	3,3	3,4	2,6	3,7	3,4	3,0	3,5
20. Video is an important aspect of the course.	2,9	2,9	2,6	4,3	2,8	2,6	3,3

The best marks were given to the tutors (items 13-14): they were well prepared and helpful. It is indeed due to their commitment and to the fact that they met them face-to-face on several occasions. Such result is very coherent with the qualitative remark often formulated during the interviews that a blend of e-learning and traditional classroom training should be the ideal solution.

Relatively low marks were given to four very important features of e-learning:

- Accuracy of tests;
- Input in practice and feedback;
- Ability to meet trainees' expectations;
- Importance of multimedia.

It is indeed important to have a look at different demographic and professional variables, such as the sex and the job position:

Regarding gender and job position, the main comments are the following:

There were only 8 women's answers for 35 men's answers. It is worth pointing out that women were globally less satisfied and then more critical than men on most items in "content", "design", "instructor" and "results". They were more pleased with the training facility.

There were 3 director's answers, 16 manager's answers, 20 supervisor's answers and 4 operator's answers. It is very important to note the following results:

1. Directors were generally above the average for most items;
2. Operators were not well prepared to the courses (item 1 and 2) and were critical on the benefits of the knowledge (item 9, 17 & 18) this hints directly at the necessity for a more systematic and customized needs analysis from the managerial level downwards in the future;
3. Operators and supervisors were enthusiastic with their instructors (item 13 and 14).

The results have been also correlated to the intensity of internet use (less or more than 26 hours) and the length at work in the company (less or more than 5 years).

Course Evaluations per Internet Use Intensity and Length in Company

COURSE CONTENT	Average	Length at job > average	Length at job < average	Internet use > average	Internet use < average
1. I was aware of the prerequisites for this course.	3,4	3,3	3,3	3,4	3,3
2. I had the prerequisite knowledge and skills for this course.	3,5	3,1	3,6	3,3	3,5
3. I was well informed about the objectives of this course.	3,6	3,6	3,6	3,5	3,6
4. This course lived up to my expectations.	2,9	2,9	2,8	3,0	2,8
5. The content is relevant to my job.	3,5	3,6	3,4	3,4	3,5
COURSE DESIGN					
6. The course objectives are clear to me.	3,5	3,9	3,3	3,9	3,2
7. The course activities stimulated my learning.	3,0	3,2	2,9	3,2	2,7
8. Interactive multimedia was essential in the course.	3,1	3,2	3,1	3,0	3,2
9. The activities in this course gave me sufficient practice & feedback.	2,5	2,9	2,4	2,8	2,3
10. The test(s) in this course were accurate and fair.	2,3	2,6	2,1	2,6	2,0
11. The difficulty level of this course is appropriate.	3,0	2,9	3,0	3,2	2,8
12. The pace of this course is appropriate.	3,4	2,9	3,6	3,3	3,4
COURSE INSTRUCTOR (FACILITATOR)					
13. The instructor was well prepared.	3,9	3,6	4,0	3,8	3,9
14. The instructor was helpful.	4,0	3,7	4,1	3,8	4,1
COURSE ENVIRONMENT					
15. The training facility at this site was comfortable.	3,4	3,6	3,3	3,2	3,6
16. The training facility at this site provided everything I needed.	3,4	3,6	3,3	3,1	3,7
COURSE RESULTS					
17. I accomplished the objectives of this course.	3,5	3,4	3,5	3,6	3,3
18. I will be able to use what I learned in this course.	3,4	3,4	3,3	3,7	3,1
SELF-PACED DELIVERY					
19. IMM was a good way for me to learn this content.	3,3	3,0	3,3	3,4	3,1
20. Video is an important aspect of the course.	2,9	2,9	2,8	3,0	2,6

The length at work in the company is not a very discriminating variable. The only significant difference is with the satisfaction with the instructor. It might be because the self-confidence which is part of an e-learning approach is less developed for recently hired employees than for employees being in the company for more than five years.

The differences are more significant with the intensity of Internet use. Not surprisingly, there is more satisfaction with the course design, results and self-paced delivery for the intensive Internet users. Less intensive users favoured much more the role of the instructor and the course environment.

The nature of the course had also a significant impact. FMEA and Capable Process were largely under-scored on most items and Quality Management out-performed in comparison to the average. The results confirm the incident reports and the qualitative interviews that FMEA and Capable Process are more difficult and contained some mistakes that were not appreciated by trainees.

Course Evaluations per Course

COURSE CONTENT	Average	FMEA	Capable Process	Quality
1. I was aware of the prerequisites for this course.	3,4	2,7	3,2	4,0
2. I had the prerequisite knowledge and skills for this course.	3,5	2,9	3,4	3,8
3. I was well informed about the objectives of this course.	3,6	3,3	3,5	4,4
4. This course lived up to my expectations.	2,9	2,8	2,8	3,3
5. The content is relevant to my job.	3,5	3,7	3,4	3,3
COURSE DESIGN				
6. The course objectives are clear to me.	3,5	3,5	3,5	4,0
7. The course activities stimulated my learning.	3,0	3,1	2,8	3,1
8. Interactive multimedia was essential in the course.	3,1	3,1	3,0	3,3
9. The activities in this course gave me sufficient practice & feedback.	2,5	2,4	2,2	3,0
10. The test(s) in this course were accurate and fair.	2,3	2,0	2,5	2,6
11. The difficulty level of this course is appropriate.	3,0	2,5	2,8	3,8
12. The pace of this course is appropriate.	3,4	2,9	3,4	3,8
COURSE INSTRUCTOR (FACILITATOR)				
13. The instructor was well prepared.	3,9	4,1	3,5	3,9
14. The instructor was helpful.	4,0	4,3	3,6	3,9
COURSE ENVIRONMENT				
15. The training facility at this site was comfortable.	3,4	3,1	3,4	3,9
16. The training facility at this site provided everything I needed.	3,4	3,1	3,2	3,8
COURSE RESULTS				
17. I accomplished the objectives of this course.	3,5	3,1	3,6	3,8
18. I will be able to use what I learned in this course.	3,4	2,9	3,3	3,9
SELF-PACED DELIVERY				
19. IMM was a good way for me to learn this content.	3,3	3,2	3,4	3,8
20. Video is an important aspect of the course.	2,9	2,3	3,3	3,8

2.3.4. Suggested Improvement

The most often quoted suggestions are improvement of tests and stimulating ability of course activities (readings, exercises, tests). It is obviously two related important features of training, and more particularly for self-training.

Suggested Improvements

1	Provide better information before course.	**17**
2	Clarify the course objectives.	**11**
3	Reduce content covered in course.	**4**
4	Increase content covered in course.	**8**
5	Update content covered in course.	**19**
6	Improve the instructional methods.	**19**
7	Make course activities more stimulating.	**28**
8	Improve course organization.	**12**
9	Make the course less difficult.	**6**
10	Make the course more difficult.	**8**
11	Slow down the pace of the course.	**4**
12	Speed up the pace of the course.	**3**
13	Allot more time for the course.	**7**
14	Shorten the time for the course.	**2**
15	Improve the tests used in the course.	**29**
16	Add more video to the course.	**14**

Then, three other high marking are up-dating content, improvement of learning methods and better information before course.

2.4. The Learning Achievements

Two ELSA modules present knowledge tests: FMEA and Capable Process. The newly incorporated EXCEL courses do so, too, but could not yet been tracked through the platform's tracking devices. These quantitative data of test results regarding efficiency measurement and transfer are a major basis for identifying training results, job behaviour and transfer and should be monitored more closely in later customized versions, in order to deliver a reliable basis to define possible ROI. The tests have been carried out two times. In the course of the learning time and two or three months later.

Tests Results

Number Total	32
Number FMEA	15
Number CP	17
Number Total Failed	9
Number Failed FMEA	5
Number Failed CP	4
Number Passed	23
Number Passed FMEA	10
Number Passed CP	13

As shown in the previous table, 32 trainees have done the tests, 15 for FMEA and 17 for Capable Process. 9 failed and 23 passed the minimum 7.5 (out of 10) minimal score for each compulsory exercises (6 for Capable Process and 4 for FMEA. Trainees had more difficulties

with FMEA: a third failed the tests. It is worth pinpointing that trainees spent much more time and made more connections on Capable Process than FMEA.

The acquisition and transfer of knowledge has been approached by asking the trainees to retake the tests two or three months after completion. The results are disappointing since most trainees who passed the tests right after the courses failed in their second attempt.

Evolution of scores from test #1 to test #2

	Test 1			**Test 2**		
	Total	Passed	Failed	Total	Passed	Failed
CP	16	10	6	17	3	14
FMEA	12	8	4	14	2	12

The worst results appear for the FMEA course where all failed at their second run. This is a very strong indicator that the future needs analysis should be more systematically customer-oriented and investigated top-down to cover real lack of job knowledge. This indicator serves as a main figure to define not only the ROI later on in terms of financial and organizational objectives, but also to maintain a circle of formative evaluation, which leads to gradually better defined organizational needs.

2.5. Qualitative evaluation on learning

It has to be pointed out that evaluations of the ELSA e-learning solution by trainees, managers, tutors and directors have been very variable, sometimes totally contradictory. Evaluation seems very much correlated to:

- Age;
- Job position in the SME;
- Previous background.

Basically, and not surprisingly, the following general observations could be made from interviews:

- The younger was the interviewee, the more enthusiastic she/he was;
- The higher position in the company structure was the interviewee, the more critical she/he has been about job relevance, course content quality and learning ability: for instance when trainees were engineers, they put the best marks to the e-learning solution;
- The more educated and trained was the interviewee, the more pro-e-learning she/he was.

All interviewees, at all levels, pinpointed the complexity of the evaluation of the efficiency of new knowledge and know how acquired through training, traditional or e-learning based. Measurable progress in quality and productivity results is highly risky since such impact might come from several sources. **But they suggested that a positive impact is visible at least on quality issue awareness.**

2.6.1. E-learning as a training and learning media

Quality of Content and Job Relevance

The vast majority of interviewees have given a very good global appreciation to e-learning as a media. They all insisted that it might be because it is the fashion and associated to new information and communication technologies at the work place.

But the vast majority, in particular executives and managers, pointed out that the current content of ELSA modules is more appropriate to beginners than to employees who already had previous training in the same field or with a strong background from initial or vocational education. But the opinions diverged about dissemination at shop floor level: some mentioned that the modules would be more adapted to employees at shop floor level; some argued that they were far too complicated.

Some interviewees were very critical with the current content of some ELSA modules, in particular Managing Quality in the Automotive Industry and FMEA. They noted that these modules are designed for early beginners, over simplistic, very low job relevance and having very poor impact on work efficiency. They thought these modules were only increasing awareness to quality issues. Their main benefit would be to prepare employees at shop floor level and middle managers for a future quality audit. It might also be a good way of refreshing current knowledge. But in SMEs without any previous intensive training to quality issues, such modules might be very fruitful for all levels of employees.

It was also noted that it was not given the opportunity of doing again a lesson in FMEA when the end has been reached. In a trial session, this should be avoided if the reason is purely commercial.

It has to be pointed out a clear national difference: Italian engineers felt the modules were of relatively high job relevance when the British counterparts were very critical.

Globally speaking, most managers and directors felt that the current level of ELSA modules is not good enough to set a standard and to provide a real basis for assessing e-learning advantages, strengths and weaknesses. Some managers pointed out that the ELSA modules demonstrate no clear advantage on existing text books.

E-learning should not be designed as an adaptation of a text book to on-line delivery. The content is the only crucial issue because it is of pedagogical nature. All other aspects are seen as purely technical.

A large majority of interviewees thought that an e-learning platform should offer a very large choice of topics and a very large choice of levels, from beginners to advanced practitioners. They all emphasized one of the key advantages of e-learning solutions: the relatively easy and rapid up-dating of the content on line even during the training sessions. In face-to-face training, it is often through a specific up-dating activity that such refreshment could be made. Therefore there is a much longer delay.

Method of Delivery

Most interviewees – trainees, tutors, managers and directors – found that the main advantage of e-learning is the freedom of access and flexible pace of learning.

Nearly all interviewees thought that e-learning should be blended with some kind of face-to-face training such as complementary classroom teaching, group work and discussion, meeting with tutor or instructor, brainstorming sessions. They pointed out that face-to-face training is more appropriate to answer precise technical questions and that the missing part of e-learning is the absence of human contact. Many of them felt isolated.

Only very few interviewees mentioned that all could be done on-line with more interactive and multi-media based technologies. Most were at high level of responsibility and had a strong intellectual background. Some managers and directors feel that e-learning is more adapted to general knowledge courses than job-specific topics.

Some interviewees suggested some figures: the average would be 70% of total time dedicated to e-learning and 30% to face-to-face learning. As a minimum, they thought that a 2 hours meeting at the end of each module might be enough. As a maximum, they suggested a 50/50 perfect balance. None has been actually for a 100% traditional way of delivery. 100% were in favour of e-learning: the use of new technologies should not be limited but monitored properly.

There was a large consensus on the need of a capable instructor or tutor able to answer both technical questions and content related questions within an acceptable time frame. Obviously on-line chatting would be welcome but a majority of trainees would request the availability of the tutor during face-to-face meetings. Therefore the tutor needs to be very familiar with the content itself, i.e. to be a true expert, exactly like a trainer in the traditional approach. But it has also to be familiar with information and communication technologies as well as the use of Internet.

Some trainees felt that in e-learning there is no need to have contact with other trainees. They also pointed out that asynchronous solutions might be more appropriate than synchronous options that would be difficult to run when work pressure is high and permanent.

Main Perceived Differences

CLASS ROOM TRAINING	E-TRAINING
Each participant is at the same level in the course	Participants might be anywhere in the course
Fixed and strictly scheduled pace of learning	Totally flexible pace of learning
Interactivity is part of the learning process during group working sessions	Interactivity is treated independently as a "section" of the platform
More attention due to physical and compulsory presence in the class room	More distraction due to large interaction with current job pressure (urgent tasks, telephone, etc.)
External location	Internal location
2 hours sessions	30-45 minutes sessions

Most interviewees suggested that time schedule should be systematically given up front for each lesson in order to allow the trainee to plan her/his training programme. Lessons should not exceed 30-45 minutes. But some of them pointed out the possible distraction due to the

presence at the factory, an incentive for the trainees to tackle urgent tasks, emergency telephone calls, etc.

Some managers suggested that interactivity should be a real part of each module and not only a separate section on the general platform site. This will indeed require a complete redefinition of the modules, including their content itself and the way the knowledge is delivered. Some interviewees insisted that true electronic on-line help desk should be made available 24 hours a day, seven days a week and 365 days a year.

Quality of learning

There are no criteria to assess the differential in the quality of the learning process. Most trainees who were trained in traditional ways at college or training centre mentioned no real difference.

Some interviewees mentioned that they feel the traditional approach more effective than e-learning with the current content and settings of the ELSA platform. Some others felt that e-learning might be more efficient if the trainee has already a background in the field.

The use of multimedia is highly recommended and is not considered as potentially distracting. But is must be fully integrated to the "scientific" content. It should not take too much time to download a video clip to prevent remote navigation on Internet while waiting several minutes for a clip of 30 seconds.

A majority of interviewees linked the quality of the learning process to the role of the tutor. Some inexperienced trainees with no previous use of Internet mentioned they were isolated and scared in front of the computer. One of them simply stopped the module despite the help of his tutor.

Managers and directors pointed out that clear and precise objectives should be set up for each trainee before engaging in a particular module. Trainees found that an increased self-responsibility was not at all more motivating. They did not change their job procedures because in SMEs, performing the tasks in time is much more important than acquiring new knowledge.

Work Organization

None of interviewees recognised that e-learning would require dramatic change in work procedure and organisation. Most of them suggested that the main problem in SMEs is availability of time to dedicate to training at the work place. Some suggested to have a weekly schedule – one hour a week during two or three months for instance –. Such schedule should be programmed and fixed in advance.

Most of them appreciated the option of a dedicated e-learning room with several computers with ADSL or cable connexion. Some explained that the opportunity to exchange with other trainees would increase the quality of the learning process.

Rewarding

All interviewees pointed out that a certification of the training through real selective tests and exams would dramatically change the motivation to learn and to apply what has been learnt to their working practice. In such a case, a risk of failure is fully considered as part of the deal. A certification would be a strong incentive to learn at home.

Very few interviewees, mainly in England, mentioned they actually used and that they were prepared to use the ELSA platform at home. But they all recognised that the opportunity to learn during working time is generally welcome. The organization of work should be adapted to e-learning, allowing trainees to avoid any other tasks (even on emergency calls) to disrupt they training time.

Improvements

All interviewees pointed out that there are plenty of room for further improvements. The main suggestion is clearly about tailor-made solutions. Unanimously, directors and managers are requesting company-specific e-learning materials.

Several managers pinpointed that a tool to identify the needed competencies, i.e. a skill map, and therefore the individual training needs, is missing for all ELSA courses. This would make the courses more tailor-made to each user. Courses should then have several levels of complexity.

Some interviewees suggested that more multimedia materials should be added, making the courses more attractive.

Some trainees emphasized the need for more collaborative work for both theoretical parts and practical exercises. They think that synchronous working is better for problem solving. Exchange of ideas and opinions would improve the capacity of understanding.

2.6.2. Cost of e-Learning and Return on Investment

As previously pinpointed in deliverable 5.1., evaluating the return on investment in training is very complicated since gains in quality results, productivity, efficiency and motivation at work are always due to several factors. Going back to Kirkpatrick, the widespread, four-level model is supported by the evaluation of the training programs. The model helps in selecting the necessary data for the respective analysis step, and usually determines until when the data must be made available in order to influence the process of evaluation. The levels are distinguished by : Reaction -Learning-Behavior and Results (ROI). We gathered qualitative data on the reaction level, which concerns the reaction of all the participants to the training program . That includes satisfaction with the material used, as well as the premises, and so on. – Furthermore, participants were asked for their views regarding the learning method, the substance of the training itself, etc…

The reaction level is the most frequently applied level of evaluation. But on its own, it's not enough to implement improvements to the training program. This level proved to be only an *indicator* of the problems that may exist.

The second level deals with the effectiveness of the course in conjunction with the question: How much, if at all, have participants learned about the techniques and skills introduced during the training. Here we have gathered quantitative post measurement data (see section 4).

The third level takes stock of work behavior, and to what extent the participants have really applied lessons from the program to their workplace,-- that is, whether **knowledge transfer** has taken place. This was partly done by gathering qualitative, subjective data through the interviews taken, most of all by the attempts to gather data by reassessing the tests and learning effectiveness over time to reflect the job-relevance.

The fourth level confirms changes made to business processes within the organization -- changes arising from altered work behavior. This occurs based on calculations of the R.O.I index -that is, the comparison of the investment in training and the training's financial and organizational benefits.

The following data are typical: costs, absence due to illness, customer satisfaction, change in production processes, reduction of waste etc. The criteria must harmonize with the training objectives, in addition to also reflecting the firm's goals.

During the interviews regarding the ELSA modules, it has been impossible to get any estimation for several reasons:

- Inaccuracy of most modules
- Weak job relevance
- Experiential nature of the trial

Most managers and directors pointed out the fairly small impact on quality and efficiency. The impact on employees' motivation was mainly related to the use of new information and communication technologies. But it was more motivation to learn through multimedia than motivation through increased and/or improved commitment. The main impact was the quality issue awareness.

Most interviewees at managerial level pointed out that e-training is cost saving compared to traditional class room training not only for the organization but also for the individual trainee when training is not during working time.

The three SMEs quoted the following average figure: An overall cost, including part of computer cost and connexion time, of €50 per trainee and per hour.

RA calculated a budget of €500 per trainee and per module on the basis of 10 hours training time par module. But it has to be pointed out the huge differences in the time spent: some trainees, in particular those with a previous background in their module, mentioned a training time of 3 to 4 hours, some others spent 15 to 20 hours on the same modules.

SV estimated the overall cost of the trial sessions to €50,000 for approximately 1,200 hours spent by all people involved, including tutor and management. The company is by far the largest of the ELSA consortium and has explicitly integrated training as a strategic tool for its future growth. The average age of technical employees is very low and most technicians are highly prepared to spend time on learning.

While stating no precise figure, TS found out that e-learning is more flexible and cheaper but could not be substituted fully and for all applications to traditional face-to-face training.

Globally speaking, the impact of the ELSA trials on quality at work, productivity and/or efficiency has not been evaluated by managers and directors since there was no tool available for such purpose. Most of them mentioned that such impact has been limited but appreciated the rise of awareness of quality management in their SME.

Conclusion

It has to be pointed out that the ELSA evaluation tool kit, in particular the interview guide, was felt as far too complicated and sophisticated for SMEs managers and employees. It should be kept as a general lesson from the ELSA project that evaluation tools should be very simple and easy to manage. In SMEs, employees could not devote a lot of time to such exercise.

Several general positive and negative lessons have been learnt through the ELSA trial project:

- The availability of hardware should not be limited whether e-learning is carried out in a dedicated room or at the work place;
- A blend of face-to-face training with e-learning is a general consensus: at least a human contact should be made at regular "check point" session within each module;
- A clear set of "measurable" objectives for the organization as well as each individual should be set up front;
- A strong attention should be paid in the course design to the language: each module for trainees at shop floor level should be in her/his mother language. English should be strictly limited to managers. Multiple translation should be prohibited[1];
- Each topic should be available in several levels of content and difficulty in order to be adapted to beginners at shop floor level or to highly educated engineers or managers;
- Formative evaluation should gradually improve a more customized needs analysis, independent from 'desirable' contents, because the added value of learning effects lies in a changed job behaviour, which – regarding the lack of transfer – seemed to be rather poor, so far;
- Tutors with the relevant expertise for each module should be made available either internally or externally.

[1] Such as a module designed by a French trainer, translated into English, then to Italian, then back to English!